A METHOD FOR EVALUATING SERVICE LEVELS

STRATEGIC MANAGEMENT OF CHANGE

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ABSTRACT

The purpose of this research project was to develop simple forms for analyzing structural fire and wildland fire risk and response factors for designated fire management zones in a wildland urban interface region. This research employed historical and action research (a) to divide the district into fire management zones based on common risk factors, (b) to identify the factors that could provide a comparative risk rating for wildland fire risk and structural fire risk, and (c) to identify factors that could be used to analyze fire suppression response.

A review of literature was conducted on fire response zone designation, risk analysis, deployment and various methods for measuring deployment. The majority of the literature reviewed was intended for use in municipal settings. The geography of the region precluded the use of deployment analyses developed for response to cities laid out on a grid. Methods for analyzing wildland urban interface risks were also reviewed. Forms were developed based on the common factors that were presented in the literature.

Recommendations include using the forms developed to analyze the central and eastern portions of San Juan Island for the purpose of determining the need to relocate or combine fire stations. Other recommendations include the use of Geographical Information System (GIS) to measure response and travel times for each fire management zone.

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INTRODUCTION

A number of discussions in the recent past have centered on what level of service of structural and wildland fire suppression is appropriate to various geographic areas within San Juan County Fire District #3. To be able to answer those questions, the department must first determine what level of service we are currently providing. Currently our station placement is based on where land for fire stations was donated in past decades. Those donations were based on perceived or actual needs by the residents in an area for fire protection within the neighborhood. Staffing levels have never been analyzed, and are set arbitrarily. The department has not addressed availability of water supply systematically. The department has not addressed apparatus and equipment needs systematically. There clearly was a problem: the department has not conducted any analysis of existing risks and response levels.

The purpose of this applied research project was to identify factors for determining fire management zones, fire service risk analysis and analysis of level of response. In order to effectively plan for future resource needs, resource allocation and resource location, a method of analyzing the level of service provided by the department is needed. Prior to analyzing the department, a determination must be made of what elements should be measured. To effectively measure those elements in a diverse community, a method for dividing the district into fire management zones must be developed. The following research questions have been developed to help answer these problems:

1. How should fire management zones be identified?
2. What elements should be included in a risk analysis of each fire management zone?
3. What factors should be included in an analysis of response levels?

Historical and action research method was used.

BACKGROUND AND SIGNIFICANCE

San Juan Fire District Three provides fire protection to Pearl Island, Brown Island, and the portion of San Juan Island outside of the town limits of Friday Harbor. The population of San Juan Island was estimated in 1995 to be 5950. San Juan Island is approximately 53 square miles. The town of Friday Harbor is approximately one square mile. Approximately 1800 persons reside inside of the town limits. The other two islands total less than 2 square miles, with a combined population estimated to be less than 100 persons. The district has an automatic mutual aid agreement with the Friday Harbor Fire Department.

San Juan Fire District Three was formed in 1958. Prior to that time, fire protection for the district was provided by the Friday Harbor Fire Department. Fire suppression was provided by a single engine response from Friday Harbor. Anecdotal information indicates that response times often exceeded thirty minutes. During the 1960s and 1970s, community groups built neighborhood fire stations in the Cape San Juan, Little Mountain, Sunset Point and Roche Harbor neighborhoods (see appendix A).

A station was added to the Eagle Crest neighborhood in the 1980s following a structure fire in that neighborhood. The first arriving fire engine was responding from approximately 3.5 miles away, and the response time was over fifteen minutes. No information remains to indicate whether the district analyzed the response area to determine the need for a station. Anecdotal information indicates that the decision to build the station was a reaction to the structure fire.

The district is divided into response areas, referred to as “boxes”, for ease of dispatching. The majority of these boxes were determined by estimating the point on each major road that represents half way between the two closest stations. Several of the boxes were delineated to differentiate between

neighborhoods having hydrants and those requiring a water tender. Brown Island is represented by a separate box, while Pearl Island is not.

The district has been recording the location of incidents and type of incident since 1988. Each of these incidents was logged according to box number. The district has not made use of this data to determine how many incidents, and of what types have occurred in each box. Fire loss data has been logged, but property values at incidents have not been logged. The property values of entire boxes have not been determined. No estimates of population or number of commercial enterprises has been made of the boxes.

Parts of the district are served by private or public water systems. The majority of the district does not have hydrants, and the department relies on tenders. Water supplies have been mapped for each box.

The district protects areas that would be classified as rural and suburban. Approximately 700 acres are State or National Parks. There is a large percentage of the area that is in active silvaculture. Agriculture is present, with hay and cattle predominating. Large areas of undeveloped lands with dense accumulations of brush and reproduction timber or ecotonal transition exist over previously logged lands. Fuel types vary from grassland-prairie and oak savannah to lodgepole pine and mature fir-cedar forests.

Neighborhoods vary from trailer parks to expensive hill top homes. Several neighborhoods are inaccessible to structure (ICS type 1) engines. There is a significant risk of wildland-urban interface fires.

The department responded to an average of 140 fire incidents per year between 1993 and 1997. Of these, 5% were structure fires, 13% were wildland fires, 7% were other fires, and 8% were

rescue calls, including motor vehicle accidents. The number of calls has steadily increased. In 1987, the department responded to 73 incidents. In the first nine months of 1998, the department responded to over 150 incidents.

The district tracks response times as the time from the first call to dispatch until arrival of the first person with a radio. In a large percentage of incidents, the responding chief officer or the station captain may arrive prior to the first arriving apparatus. The district has not tracked reaction times, response times of first arriving apparatus or response times of later arriving apparatus.

The district is currently discussing a possible merger with the Friday Harbor Fire Department. Currently, the district shares space with Friday Harbor in their station, where the district houses two engines. The Friday Harbor Fire Department is preparing to purchase a new ladder truck, which will necessitate removing one engine from their station. The district has not decided whether to build a new station, eliminate the engine, relocate the engine or relocate a station. The Board of Fire Commissioners has discussed the possibility of building a headquarters station with the administration. The district is also facing approximately 2.2 million dollars in replacement costs of apparatus over the next ten years. The Commissioners have directed the administration of the district to provide an analysis of apparatus and facility needs. In order to accomplish this, the district must determine what the existing levels of service are, and what levels of service should be provided. A method of analyzing levels of service is needed.

In 1998, I attended the National Fire Academy course Strategic Management of Change. In that course, a systematic change management model is presented. According to this model, the first task in creating a change within the organization is to identify organizational conditions, and compare those conditions to the existing mission. Assessing the quality of services currently being provided is the first step to accomplishing this task. In reviewing the situation at San Juan Fire District #3, it was

obvious that a method for measuring quality of service was necessary prior to deciding what changes should be made.

LITERATURE REVIEW

1. How Should Fire Management Zones be Identified?

International City Management Association (ICMA)(1988) advocates utilizing a compass to plot response times as one-minute gradients around existing stations. One fault identified with this method is that "fire engines and trucks must use the existing roadways, and can't reach an emergency scene 'as the crow flies'" (Sybesma, 1995, p.55). A second method described is to map an ideal response area as a 4.5 square mile diamond overlaid on a grid map of the service area (Sybesma, 1995). Sybesma (1995) discerns this approach as working best "...in areas that are relatively flat, with perpendicular streets, and few, if any, artificial barriers" (p.56).

Both these and others (NFPA, 1997a) advocate the use of an adopted response or travel time standard to determine response areas. NFPA (1997a) promotes the use of computers to determine actual travel times. Other pertinent data, such as population and incident location can be overlaid on the response time map. Sybesma (1995) also advises analyzing factors that may influence fire station location.

The Washington Department of Natural Resources (DNR) sets an objective of containing 96 percent of its fires under 10 acres in size (TriData, 1997). The DNR does not set a travel time objective, but does maintain an unwritten policy of 30-35 minute response time for wildland fires (TriData, 1997).

The Commission on Fire Accreditation International (CFAI) defines a fire management zone as "An area used to define or limit the management of a risk situation" (CFAI, 1997, p. 6.4). A fire

analysis zone is defined by CFAI (1997) as "A geographic area that is classified according to one or more risk categories" (p. 6.57). CFAI (1997) also recognizes a first due area as "The portion of a jurisdiction that each response company has been assigned to be the first unit to arrive" (p. 6-58). In contrast to the previously cited definition methods, the fire management zone and fire analysis zones are based on similarity of risk, while the first due area is a reversion to areas based on response times from existing stations.

The concept of establishing planning areas based on similarities of risk are echoed by the Western Fire Chiefs Association (WFCA, 1991). In planning for mitigation and response to wildland urban interface fires, the concept of risk rating areas is proposed:

> The risk rating area should consist of relatively homogeneous development with similar risk factors so you may be able to apply the risk instrument to subdivisions but may not be able to apply it to a whole county...The rating area may be of any size; you need to make sure it is consistent with your fire occurrence data for your area; for your fire protection agency or existing boundaries or whatever sub-areas within your jurisdiction that you need to evaluate (p.17).

The approach used by the DNR is similar in that planning areas are categorized by similar risk factors, such as fire climate, fire regime and fire occurrence (TriData, 1997).

Sybesma (1995) reports that the Texas Board of Insurance used a circular service area size of 7.065 square miles while the diamond service area is 4.5 square miles. The circular service area equals 4,521.6 acres, while the diamond service area equals 2,880 acres. WFCA (1991) recommends that rating area size be consistent with the use of fire occurrence per 1000 acres, and suggests the use of the

existing public lands survey system. Under this system, a planning area would be one square mile or 640 acres.

Fire management zones were defined for the department after reviewing the literature. The fire management zones were based on similarity of risk and response assignments. Travel times, topography and development patterns were among the factors were selected from the literature as pertinent to this project.

2. What Elements Should be Included in a Risk Analysis of Each Fire Management Zone?

Fire incident rates, fire loss rates and fire "save" rates are all factors than can be used for structural fire suppression (ICMA, 1988). Fire fatality and casualty rates should also be considered (ICMA, 1988).

CFAI (1997) opts for the probability and consequence of a hazard, rather than historical fire data. CFAI (1997) also considers fire flow, demographics and occupancy risk to be part of the overall hazard analysis. Four risk categories for occupancies are presented by NFPA (1997a), with high hazard, medium hazard, low hazard and rural. CFAI (1997) addresses similar risk categories of occupancies, grouping occupancies into maximum, special, typical and remote risk categories. CFAI (1997) also recommends analysis of non-fire service demands.

Needed fire flow is the basis for service level determinations by the Insurance Service Organization (ISO) (Hickey, 1993). Classification of risk areas by required fire flows is one method of analyzing fire zones (CFAI, 1997). Resource requirements may also depend upon required fire flow (CFAI, 1997).

In addition to occupancy and structure hazards, the Montana Department of Public Lands risk-rating system addresses access, topography, fuels and fire occurrence (WFCA, 1991). Additional

factors that contribute to risk of loss from wildfire should be incorporated into the assessment (NFPA, 1997b).

A disparity was evident between analyzing structure fire hazards and other emergencies that are considered the traditional bailiwick of fire departments and wildland fire hazards, which are often considered to be the responsibility of forestry or resource agencies. Some overlap was noted in literature on wildland urban interface fires. After reviewing the literature, a list of factors for hazard analysis was developed based on the hazards of both wildland and traditional fire service emergencies. These factors were integrated into risk assessment forms for analyzing both wildland and structural fire risk.

3. What Factors Should be Included in an Analysis of Response Levels?

The traditional analyses of fire suppression response include staffing levels and response times for first arriving equipment (ICMA, 1988; Rand Corporation, 1979). In addition to distribution and staffing of companies, comparative service levels should also address concentration, or the number of companies available (CFAI, 1997). Additional factors include response times of second and later apparatus (Rand, 1979).

Response time includes a series of steps, all of which can be divided into reaction time and travel time (CFAI 1997). Travel distance is considered by the Insurance Service Organization (ISO) (Hickey, 1993). CFAI (1997) addresses travel times in addition to response times. Travel distances of 5 miles of more reduce the rating under ISO to "unprotected".

An additional factor would be the number of personnel on scene within 10 minutes of alarm and within 15 minutes (NFPA, 1997). Response in less than 10 minutes is often related to the time-temperature curve, and the time to flashover of a room and contents fire (NFPA 1997; Crosley, 1994).

The ability to provide resources to all incidents that require those resources is another factor (CFAI, 1997, NFPA 1997).

Service level objectives should be established by the jurisdiction for technical rescue, hazardous materials response, emergency medical services (EMS) as well as fire suppression (CFAI, 1997). In each of these criteria, apparatus and equipment objectives should be identified, along with response times and staffing (CFAI, 1997). Pumping capacity should also be analyzed for fire suppression (CFAI, 1997).

Water supply is a factor. The availability of water supplies in the area is a major factor in measuring the comparative service level (ICMA, 1988). The presence and capacity of municipal supplies should be considered (ICMA, 1988). The ability to provide 250 gpm continuously is recognized by ISO as an alternative to water mains (Hickey, 1993). The department should have the ability to pump 250 gpm continuously from a source one mile from the fire (NFPA, 1997).

The reliability that the apparatus and staff will be available is considered by CFAI (1997). Historical factors that affect response reliability should be factored in (CFAI, 1997). The reliability of first due and later arriving units of each type is factored into several response models (Marianov, 1990).

Staffing, distribution and reliability are all factors in wildland fire suppression evaluation (TriData, 1997). Capability to effectively extinguish wildland fires is dependent on the size and type of fire (WFCA, 1991; NWCG, 1989). DNR measures effectiveness both by response times and size of fire when contained, with a goal set by DNR to keep 96% of all wildfires to 10 acres or less (TriData, 1997). NWCG (1989) indirectly provides estimates of personnel required to contain fires, by estimating production rates and fireline length.

It was apparent that different factors can be used to compare wildland firefighting and traditional fire department activities. After reviewing the literature on both aspects, the factors advocated for each were investigated for applicability to the situation on San Juan Island. A list of factors to be used for level of service analysis was developed based on the literature review. These factors were integrated into response analysis forms.

PROCEDURES

The need for a method to determine levels of service has been long evident in San Juan Fire District #3. Each year, the administration has been asked to justify the proposed budget expenditures, but has not been able to quantify the needs based on a defined level of service. This situation appeared more critical when facing decisions about building a new headquarters station, or changing the number and type of apparatus.

Historical research was used. A literature review was conducted to determine what factors were being used or advocated by other organizations. Initial materials reviewed provided only vague recommendations, so the search was broadened to include materials or literature on fire company deployment and fire station location. While the material was more specific, it was also dated and tended to be useable only in municipal settings. Virtually no material was found that addressed dual responsibilities of wildland and structural fire response.

Several materials that were designed for community planning were found to be helpful in analyzing the wildland fire risks, but no useful materials were located that addressed how to measure level of service response for wildland firefighting. Other limitations to the research resulted from the lack of general agreement about risk factors, zone planning and response measurement in the literature.

The published probabilistic and deterministic methods for measuring deployment would provide inaccurate data for use in San Juan County. All of these methods simplified response data by assuming all responses were on a municipal grid. Most of the work on deployment issues has been completed within an urban framework, and assumed career staffing. Most were narrow in focus, and addressed the placement of single stations.

Action research was used. The factors identified in the literature review were selected to create a list of factors for analyzing deployment in San Juan County. A map of fire management zones was developed using suggestions from the literature review. The zones are listed in appendix B.

The factors were then developed into a series of forms for analyzing wildland fire risk, structural fire risk and response levels. The risk forms are designed to compare risks from one zone to another zone within the district. The response form is intended to compare existing response with response using other deployment options.

Relative weighting of each of the factors was based upon historical data. A range of values was selected to provide comparison between zones within the district. For example, the average number of wildland fires per 1000 acres was determined to be approximately 0.6 per year. The range for low was set below 0.6, while the range for high was set above 0.6 per year. This was then compared to two sample zones for which the response box was identical to the fire management zone. Similar procedures were used for each of the remaining ranges. While this will not provide correlational data, it will provide comparative data.

RESULTS

What are the fire management zones for the purpose of this evaluation? Forty-three management zones for the district were established based on the following criteria:

1. Consistent response time range.
2. Common development patterns.

Attempts to set a single response time standard for the entire district were fruitless. There are residences within the district where travel time from the main road to the residence would exceed total travel times for other locations. The fire management zones where identified wherever possible to have a common entrance point. Future deployment studies could measure the effect of station relocation on those common entrance points. Travel time to any location within the fire management zone would be constant. This would reduce the need to measure actual travel times to a wide variety of points. Within the fire management zone, travel times can be estimated as a range. This is made possible through the application of assigned travel speed to specified road types. The list of fire management zones is included as appendix B.

Common development patterns were used to delineate zones where development differed from neighboring zones. Factors included municipal water systems, density, access and land use. This led to zones of inconstant size, however size can be quickly calculated by use of the County's GIS program. Fire occurrence per thousand acres can be easily determined.

How should the district measure risk within each fire management zone? Separate analyses were developed based on wildland fires and all other responses. Each fire management zone should be analyzed based on the following factors for wildland fires:

1. fire occurrence
2. structure density
3. access
4. topography

5. fuels

For all other types of incidents, the following factors should be analyzed:

1. fire incident rates
2. fire loss rates
3. fire fatality and casualty rates
4. needed fire flow
5. occupancy risk: high hazard, medium hazard, low hazard and rural
6. non-fire service demands
7. access

The use of the Montana Department of Public Lands rating system (as cited in WFCA, 1991) would provide a more complete, more detailed analysis of wildland-urban interface risk. To use this system would require designating smaller fire management zones. As all zones within the district are wildland-urban interface zones, the number of zones would climb to well over one hundred. Further, the system is designed for Montana, and would require modification for use in other fire regimes. Finally, the system would require extensive on-site data collection. Given the current staff workload, it is unlikely that San Juan Fire District #3 personnel could complete a project as extensive in the timeframe allotted.

A concise Wildland Risk Rating System was developed to analyze the fire management zones. A similar format was used to create a Structure Fire Risk Rating System. The rating systems are included as appendix C. Both were designed to provide a quick comparison of relative risk within the district.

What factors should be included in an analysis of response levels? Response should be measured based on:

1. Staffing levels
2. Response times for first arriving apparatus
3. Response times of second arriving apparatus
4. Water supply

A response rating form was developed to analyze the level of response provided to each fire management zone. The form is included as appendix D.

Staffing analysis of paid departments is based on the number of firefighters assigned to a particular engine. Staffing cannot be measured this way in this situation. San Juan Fire District #3 relies on volunteers to staff the apparatus. The number of firefighters available for a response is variable, dependant on the number of volunteers who are in the area and able to respond. Staffing analysis of any management zone would thus include a measure of the number of firefighters assigned to the responding apparatus, and the expected number of firefighters likely to respond based on historical data.

Travel times can be simply calculated as a range for each fire management zone. Reaction times for each apparatus can be expressed as a range from data kept by the County dispatch center. This range can be added to the travel time range to provide a total response time range. Response time ranges for first and later arriving apparatus can be analyzed for various deployment options or compared to a response time standard.

Water supply should be addressed for each fire management zone. Only three of the forty-five fire management zones are fully covered with hydrants. The remaining forty-two areas must be analyzed for available water supply based on static sources and response time for the first arriving tender.

No weighting or ranking system was developed for analyzing response. It is assumed that the response data would not be used to compare fire management zones with each other. The district would instead compare each fire management zone with a target range of acceptable values.

DISCUSSION

Application of the techniques and methods cited in the literature to San Juan Fire District #3 was difficult and required adaptation. ICMA (1988) and Sybesma (1995) advocated methods for determining response areas that are consistent only with gridded streets. CFAI (1997) methods are based on existing station response areas. While the existing situation can be analyzed, changing station locations would require altering the response areas.

ICMA (1988) and CFAI (1997) assessed risk factors for traditional fire department response, such as structure fires. WFCA (1991) assessed risk factors for interface fires. No source addressed the range of incident types that San Juan Fire District #3 can expect. Virtually every source that addressed staffing assumed a constant response staff, as that provided by a paid staff (ICMA, 1988; Rand, 1979; Marianov, 1990). Response times in San Juan Fire District #3 in the past year varied from two minutes to over thirty minutes. Reaction times varied from one minute to eighteen minutes. Most studies assumed that response times were related only to travel time or distance.

Given the extent to which the other studies offered techniques that differed from what was required for this district, the other studies did provide suitable factors or concepts from which an analysis of service can be made. Deployment decisions are not made solely on risk and response level analysis. Economic and political concerns affect the determination to locate stations and apparatus. Staffing in volunteer organizations is often as dependent on demographic and social issues as on the department's desires.

Utilizing a strict methodology for evaluating the current service levels and comparing them to possible deployment options will provide solid comparative data for future decisions about fire station location, staffing, apparatus assignment and water supply development. Any areas where the department is underprotected or overprotected should become evident. The relative weighting of each factor used in the analysis could be vary, dependant on the question or proposal.

RECOMMENDATIONS

San Juan County has recently completed entry of all streets and boundaries into a computer Geographical Information System (GIS). Entry was done using hand-held and vehicle-mounted Global Positioning Satellite (GPS) receivers. Through a cooperative agreement with the County, San Juan Fire District #3 will be entering data on fire by size, type and location into the GIS system. Each fire management zone will be defined on the system. All roads within the district will be assigned a travel speed. The fire station locations will be entered.

Once this data has been entered, it will be possible to accurately estimate travel times to each fire management zone from existing stations and from proposed stations. It will be possible also to graphically view fire sites and water supply locations. The district will have several key tools for future planning.

The risk assessment and response assessment should be completed first for all fire management zones in the Station 31, Station 33 and Station 36 response areas. The existing response should be compared to proposed options. The Board of Fire Commissioners has expressed interest in locating a station on the west side of Friday Harbor, or near the Friday Harbor airport. Travel time comparisons for all of the aforementioned fire management zones should be made, as well as total response time comparisons. The total response time comparisons should be estimated for both an unstaffed station and

for a staffed station. The district should assess the cost-effectiveness of a day staff and resident volunteer program, in which the station is staffed with career firefighters during the day, and with volunteers who reside in the station at night.

The areas mentioned above are the most pressing. Once decisions on deployment have been made for those areas, the department should address the north end, which is currently served by Stations 34 and 35. Consideration should be given to fire station location and staffing. As time permits, the remainder of the district should be analyzed. Certain zones present obvious difficulties in providing an acceptable response, particularly Brown and Pearl Island. Deployment options for those zones are limited.

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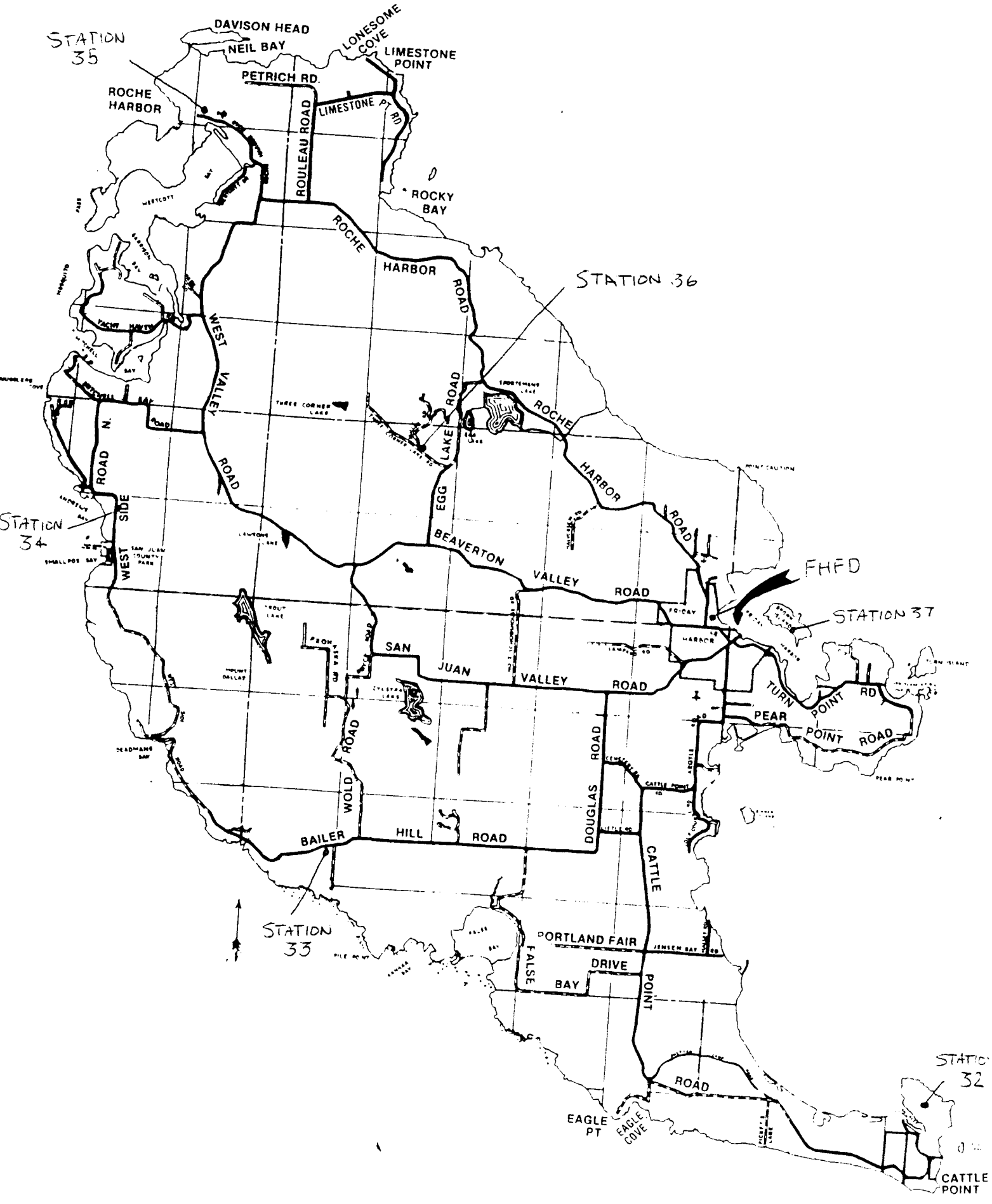
APPENDIX A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NEIL BAY
LONESOME COVE
LIMESTONE POINT
PETRICH RD.
ROCHE HARBOR
ROULEAU ROAD
LIMESTONE PT RD
ROCKY BAY
ROCHE HARBOR ROAD
STATION 36
WEST VALLEY ROAD
N. ROAD
WEST SIDE ROAD
STATION 34
EGG LAKE ROAD
ROCHE HARBOR ROAD
BEAVERTON VALLEY ROAD
FHFD
STATION 37
SAN JUAN VALLEY ROAD
TURN POINT RD
PEAR POINT ROAD
WOLD ROAD
DOUGLAS ROAD
CATTLE POINT ROAD
BAILER HILL ROAD
STATION 33
PORTLAND FAIR
FALSE BAY DRIVE
POINT ROAD
STATION 32
EAGLE PT
EAGLE COVE
CATTLE POINT

APPENDIX B

San Juan County Fire District #3 Fire Management Zones

Zone #	Zone Name	Zone #	Zone Name
1.	Cape San Juan	24.	Roche Harbor
2.	Cattle Point	25.	White Point
3.	American Camp	26.	British Camp
4.	Eagle Cove	27.	Yacht Haven
5.	Jensen Bay	28.	West Valley
6.	Portland Fair	29.	Sugarloaf Mt.
7.	Golf Course	30.	Boyce Road
8.	Douglas Road	31.	Mitchell Bay
9.	Turn Point	32.	Sunset Point
10.	San Juan Valley	33.	Cady Mountain
11.	Beaverton Valley	34.	West Side
12.	Hillview Terrace	35.	Mt. Dallas
13.	Halvorsen	36.	Hannah Highlands
14.	Three Meadows	37.	Hannah Heights
15.	Channel View	38.	F H Reservoir
16.	Eureka	39.	Wold Road
17.	Egg Lake	40.	Little Mountain
18.	Mineral Point	41.	Kanaka Bay
19.	Rocky Bay	42.	False Bay
20.	Roche Harbor Reservoir	43.	Brown Island
21.	Rouleau Road	44.	Pearl Island
22.	Neil Bay		

APPENDIX C

San Juan County Fire District #3 Wildland Fire Risk Assessment

Fire Management Zone # _____ Zone Name: _____

Primary Access: _____

Secondary Access: _____

Water Supplies: _____

_____

Special Considerations: _____

_____

Wildland Risk: _____ Interface Risk: _____

1. Fire occurrence		
More than 0.8 fires/1000 acres	5	
0.4 to 0.8 fires/1000 acres	3	
Less than 0.4 fires/1000 acres	1	
2. Structure density		
More than 0.3/acre	5	
0.1 to 0.3/acre	3	
Less than 0.1/acre	1	
3. Access		
One sub-standard road	5	
Two or more sub-standard roads	3	
One standard road	2	
Two or more standard roads	1	
4. Topography		
Steep slopes, S, SW or W aspect, or dangerous features	5	
Moderate slopes or E-SE aspect	3	
Flat, or N aspect	1	
5. Fuels		
Heavy slash, dense lodgepole pine	5	
Heavy shrub and conifer	4	
Grass, light shrub	3	
Closed timber	1	

Total (add nos. 1 through 5) _____

San Juan County Fire District #3 Wildland Fire Risk Assessment

Fire Management Zone # _____ Zone Name: _____

Primary Access: _____

Secondary Access: _____

Water Supplies: _____

_____

Special Considerations: _____

_____

Structure Fire Risk: _____ Non-Fire Risk: _____

1. Fire occurrence		
More than 4 fires/10 years	5	
1 to 3 fires/10 years	3	
Less than 1 fire/10 years	1	
2. Other incidents		
More than 8 incidents/10 years	3	
2 to 7 incidents/10 years	2	
Less than 2 incidents/10 years	1	
3. Fire loss		
More than 250,000 loss/10 years	3	
10,000 to 249,999 loss	2	
Less than 10,000 loss	1	
6. Access		
One sub-standard road	5	
Two or more sub-standard roads	3	
One standard road	2	
Two or more standard roads	1	
4. Needed fire flow		
More than 10,000 gpm	4	
5,000 to 9,999 gpm	3	
1000 to 4,999 gpm	2	
less than 999 gpm	1	
7. Density		
Commercial/mixed use	5	
More than 0.3/acre (residential)	3	
0.1 to 0.3/acre (residential)	2	
Less than 0.1/acre (primarily rural)	1	

Total (add nos. 1 through 5) _____

APPENDIX D

San Juan County Fire District #3 Response Assessment

Fire Management Zone # _____ Zone Name: _____

Water Supplies: _____

1. Travel time, first structural engine Minimum _____ Maximum _____	2. Response time, first structural engine Minimum _____ Maximum _____
3. Travel time, second structural engine Minimum _____ Maximum _____	4. Response time, second structural engine Minimum _____ Maximum _____
5. Travel time, first brush engine Minimum _____ Maximum _____	6. Response time, first brush engine Minimum _____ Maximum _____
7. Travel time, tender Minimum _____ Maximum _____	8. Response time, first tender Minimum _____ Maximum _____
9. Expected staffing, first engine _____	
10. Expected staffing, first alarm _____	
11. Adequacy of water supplies ❑ Hydrants ❑ Prepared drafting sites ❑ Drafting sites ❑ No water supplies	

Comments: